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**AIR OPERATIONS IN
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1 APR - 1 NOV 70**

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AIR OPERATIONS IN NORTHERN LAOS
1 APR - 1 NOV 70

15 JAN 71

HQ PACAF

Directorate of Operations Analysis

CHECO/CORONA HARVEST DIVISON

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Prepared by:

LT COL HARRY D. BLOUT

Project CHECO 7th AF, DOAC

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Project CHECO was established in 1962 to document and analyze air operations in Southeast Asia. Over the years the meaning of the acronym changed several times to reflect the escalation of operations: Current Historical Evaluation of Counterinsurgency Operations, Contemporary Historical Evaluation of Combat Operations and Contemporary Historical Examination of Current Operations. Project CHECO and other U. S. Air Force Historical study programs provided the Air Force with timely and lasting corporate insights into operational, conceptual and doctrinal lessons from the war in SEA.							
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PROJECT CHECO REPORTS

The counterinsurgency and unconventional warfare environment of Southeast Asia has resulted in the employment of USAF airpower to meet a multitude of requirements. The varied applications of airpower have involved the full spectrum of USAF aerospace vehicles, support equipment, and manpower. As a result, there has been an accumulation of operational data and experiences that, as a priority, must be collected, documented, and analyzed as to current and future impact upon USAF policies, concepts, and doctrine.

Fortunately, the value of collecting and documenting our SEA experiences was recognized at an early date. In 1962, Hq USAF directed CINCPACAF to establish an activity that would be primarily responsive to Air Staff requirements and direction, and would provide timely and analytical studies of USAF combat operations in SEA.

Project CHECO, an acronym for Contemporary Historical Examination of Current Operations, was established to meet this Air Staff requirement. Managed by Hq PACAF, with elements at Hq 7AF and 7AF/13AF, Project CHECO provides a scholarly, "on-going" historical examination, documentation, and reporting on USAF policies, concepts, and doctrine in PACOM. This CHECO report is part of the overall documentation and examination which is being accomplished. Along with the other CHECO publications, this is an authentic source for an assessment of the effectiveness of USAF airpower in PACOM.

[Handwritten signature of Robert W. Campbell]
ROBERT W. CAMPBELL, Major General, USAF
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FOR THE COMMANDER IN CHIEF

Maurice L. Griffith

MAURICE L. GRIFFITH, Colonel, USAF
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- (b) D00 1
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(1) ATXPP-X 1	(1) HEADQUARTERS
f. AFLC	(a) DP 1
(1) HEADQUARTERS	(b) IN 1
(a) XOX 1	(c) XP 2
g. AFSC	(d) CSH. 1
(1) HEADQUARTERS	(e) DOAD 5
(a) XRP 1	(f) DC 1
(b) XRLW. 1	(g) DM 1
(c) SAMSO(XRW) 1	(2) AIR FORCES
(d) SDA 1	(a) 5AF
(e) CSH 2	1. CSH 1
(f) DLXP. 1	2. XP. 1
(g) ASD(ADJT) 1	3. DO. 1
(h) ESD(XO) 1	(b) Det 8, ASD(DOASD) . . 1
(i) RADC(DOTL) 1	(c) 7AF
(j) ADTC(CCS) 1	1. DO. 1
(k) ADTC(SSLT) 1	2. IN. 1
(l) ESD(YW) 1	3. XP. 1
(m) AFATL(DL) 1	4. DOCT. 1
h. USAFSS	5. DOAC. 2
(1) HEADQUARTERS	(d) T3AF
(a) WCSF. 1	1. CSH 1
(b) CHO 1	2. XP. 1
(2) SUBORDINATE UNITS	(e) 7/13AF(CHECO) 1
(a) Eur Scty Rgn(OPD-P) . 1	(3) AIR DIVISIONS
(b) 6940 Scty Wg(OOD) . . 1	(a) 313AD(DOI) 1
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(b) 12TFW(DOIN)	b. AFRES(XP) 2
(c) 35TFW(DOIN)	c. AU
(d) 56SOW(WHD)	1. ACSC-SA 1
(e) 347TFW(DOOT)	2. AUL(SE)-69-108 2
(f) 366TFW(DO)	3. ASI(ASD-1) 1
(g) 388TFW(DO)	4. ASI(HOA) 2
(h) 405TFW(DOEA)	d. ANALYTIC SERVICES, INC . 1
(i) 432TRW(DOI)	e. USAFA
(j) 460TRW(DOI)	1. DFH 1
(k) 475TFW(DCO)	
(l) 1st Test Sq(A)	
(5) OTHER UNITS	
(a) Task Force ALPHA(IN) . . 1	
(b) 504TASG(DO) 1	
(c) Air Force Advisory Gp. . 1	
m. USAFE	
(1) HEADQUARTERS	
(a) DOA.	
(b) DOLO	
(c) DOO.	
(d) XDC.	
(2) AIR FORCES	
(a) 3AF(DO)	2
(b) 16AF(DO)	1
(c) 17AF(IN)	1
(3) WINGS	
(a) 36TFW(DCOID)	1
(b) 50TFW(DOA)	1
(c) 20TFW(DOI)	1
(d) 81TRW(DCOI)	1
(e) 401TFW(DCOI)	1
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(4) GROUPS	
(a) 497RTG(TRCOD)	5

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w. USMACV (MACJ031)	1

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l. Senior USAF Representative, U.S. Liaison Office	1

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b. U.S. Air Attache, Vientiane.	1

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TABLE OF CONTENTS

	<u>Page</u>
CHAPTER I - OPERATIONS IN NORTHERN LAOS, 1 APR - 1 NOV 70	1
Air War in Northern Laos	3
Ground War in Northern Laos	7
CHAPTER II - FEWER SORTIES BETTER APPLIED	17
The Hunter-Killer Team	18
The Quick Reaction Force	20
Snakeyes in Laos	23
The CBU-38	25
HOTSPOT: Use of COMBAT SKYSPOT in BARREL ROLL	26
A Change at Headquarters, 7/13AF	29
CHAPTER III - OUTLOOK	32
FOOTNOTES	35
APPENDICES	
I - (S) USAF BARREL ROLL Combat Sorties	39
II - (S) RLAf BARREL ROLL Combat Sorties	40
GLOSSARY	41
FIGURES	<u>Follows Page</u>
1. (U) Map of Plaine des Jarres	10
2. (S) Photograph of Bouam Long, Laos (Lima Site-32)	12
3. (S) Photograph of Ban Na, Laos (Lima Site-15)	14
4. (S) Photograph of Moung Soui, Laos (Lima Airfield-108)	14
5. (S) F-4 Armed with Napalm and 500# Bombs with High-Drag Fins, on QRF Alert at Udorn RTAFB	22
6. (S) High-Drag Fins (Snakeye) on 500# Bomb	24
7. (S) CBU-38 MUNITIONS--14# Bomblets After Downward Ejection from Canister, Shown in Upper Right Corner	26
8. (S) CBU-38 MUNITIONS--Pattern from One Canister, 40 Bomb- Tets, Released in Level Flight	26
9. (S) CBU-38 Munitions Against Trucks	26
10. (U) COMBAT SKYSPOT--TSQ-96 Antenna at Udorn RTAFB	28
11. (U) Support Structures at Udorn RTAFB	28

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CHAPTER I

OPERATIONS IN NORTHERN LAOS, 1 APR - 1 NOV 70

Air operations in Northern Laos in the 1970 wet season continued to play a critical role in the ground campaigns being waged to preserve the Royal Laotian Government (RLG). The area had been designated BARREL ROLL in the air war, and it was the scene of heavy U.S. air support as the North Vietnamese dry season offensive stalled one kilometer short of the Meo guerrilla stronghold of Long Tieng. As the transition to the wet season occurred, Lao and U.S. tactical (tac) air strikes helped the U.S.-backed guerrillas stop the enemy's attack and force his withdrawal to the mountains along the south and west rim of the Plaine des Jarres (PDJ).

The wet and dry season campaigns preceding the 1970 wet season covered by this report were of a pattern which had begun to be traditional in the land war for Northern Laos. Traditional except that in the 1969 wet season, for the first time in five years, Maj. Gen. Vang Pao and his Meo guerrillas had pushed the enemy off the PDJ all the way to within a few miles of the North Vietnam border. The advances of the guerrillas were supported by up to 200 USAF sorties per day which resulted in tons of enemy cached equipment and supplies lost and several thousand enemy soldiers killed. Aided by approximately 150 sorties a day, the guerrillas held their advanced positions until January, well into the dry season.
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With the dry season the advantage again passed to the numerically superior and more sophisticated North Vietnamese Army (NVA). Moving on firm roads, the enemy was able to take the offensive after finally being resupplied. Phou Nok Kok, a mountain guarding the Route 7 northeastern entry to the PDJ, was lost to the enemy in mid-January. Then in February, Xieng Khouang on the PDJ and Moung Soui in the mountains further west were given up by the guerrillas. Sam Thong was evacuated, and on 17-21 March 1970 the enemy was stopped at Long Tieng.
2/

This report is a follow-on and updating of CHECO reports that relate the see-saw ground campaign and the critical role of USAF air power in Northern Laos. "Air Support of Counterinsurgency in Laos" and "Air Operations in Northern Laos, 1 Nov 1969 - 1 Apr 1970" are the most recent and tell how air power was applied to support guerrillas in offensive and defensive campaigns.

The latter of these two CHECO reports closes with the dramatic defense of Long Tieng and by means of an epilogue tells of some gains as General Vang Pao moved to defensive positions and readied once again for the wet season. The morale of the Lao and U.S. leadership was reported as improving, and the enemy did not appear to have sufficient supplies forward to continue his offensive against stiffening ground resistance which ... is the keystone to successful use of tactical air under existing conditions in Northern Laos."
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AIR WAR IN NORTHERN LAOS

Very little change occurred in the areas of force distribution, command and control, and targeting procedures from those reported in the CHECO report "Air Operations in Northern Laos, 1 Nov 1969 - 1 Apr 1970." The management of the air continued to be characterized by complex inter-relationships between the U.S. Ambassador to Laos, who directed the effort; COMUSMACV and his Deputy for Air, who commanded and controlled the Seventh Air Force resources; and the Deputy Commander of Seventh/Thirteenth Air Force, who was the 7AF manager at Udorn, Thailand, and worked directly with Controlled American Source (CAS) officials, the ^{4/} Air Attaché (AIRA), and the Ambassador.

The BARREL ROLL air war was conducted by USAF jet and prop aircraft based in nearby Thailand. A heavily USAF-backed Royal Laotian Air Force (RLAF) provided T-28 fighters and AC-47 gunships. Airlift was accomplished by USAF transports and helicopters and the cargo aircraft of CAS-contracted Air America and Continental Air Services. To work the area in northern Laos, USAF employed tanker supported F-105s and F-4s from Udorn, Korat, Takhli, and Ubon and A-1s from Nakhon Phanom. Control of these strike aircraft was accomplished primarily by USAF RAVEN forward air controllers (FAC) flying O-1s, T-28s, and U-17s from Vientiane and Long Tieng. Some F-4 crews at Korat and Udorn served in a FAC role for fast-moving strike aircraft. The few OV-10s were flown principally from Nakhon Phanom by USAF FACs, and three USAF AC-119 gunships flew from Udorn. The Lao Military Region (MR)-II contingent of the RLAF T-28 fleet, varying between

six and 10 aircraft at each of two locations, flew from Vientiane and
5/ Long Tieng. These were augmented by strike and recce sorties of the
T-28s of Detachment 1, 56th Special Operations Wing (SOW), which other-
wise were used for training Thai, Lao, and USAF pilots at Udorn.^{6/} The
RLAF gunship effort expanded from eight to ten AC-47s as aircrews were
trained and the aircraft were transferred from the USAF.

The problems created by many commands, AIRA, and CAS, all gathering
intelligence and directing various aspects of the air war, were dis-
cussed by the BARREL ROLL Working Group (BRWG). This group normally met
about twice a month at Hq 7/13AF, Udorn to resolve operational matters
and to prepare positions for presentation to 7AF at Tan Son Nhut, where
the group met once a month. Discussions were candid and resulted in
longer talks between Command, Intelligence, and Operations counterparts
before and after the formal meetings.

The replacement of most of the U.S. key people responsible for
conducting the air war in Northern Laos was also a factor in how the
war was directed during the 1970 wet season. The positions of 7/13AF
Director of Operations and his Assistant both underwent two turnovers
and a new Deputy Commander arrived in October. At Tan Son Nhut, a new
Deputy COMUSMACV for Air/Commander, Seventh Air Force took charge in
September. Orientation briefings for the new leaders frequently resulted
in challenges to the existing concepts and operations. Sometimes explana-
tions were adequate; sometimes new plans or procedures were soon implemented.

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The involvement of the USAF in Laos and the role of the RAVEN FAC were subjects causing unique problems of command and control. Flying in civilian clothes, RAVENS were USAF pilots flying from sites in Laos and under the supervision of the Air Attache, his senior RAVEN, and the USAF commanders at five Lao airfields. Considering that the RAVENS operated outside the usual Seventh Air Force chain of command and yet directed one-third to two-thirds of USAF tactical air sent to BARREL ROLL,^{7/} they remained the subject of concern for USAF commanders. The previous CHECO report aptly stated the reason for their concern: "USAF FACs were flying secretly from Laos, under control of the Air Attache for a Meo ground commander advised by the CIA, to direct strikes by USAF planes based in Thailand under control of a command center in Vietnam."^{8/}

During the 1970 wet season, the U.S. air sorties allocated to BARREL ROLL dropped significantly from the 200 per day provided during the Long Tieng emergency in late March.^{9/} The daily rate during September averaged 34 sorties flown. On 10 October the daily U.S. fighter-attack sortie rate for Northern Laos was set at approximately 30, representing six per cent of the entire SEA U.S. fighter-attack strike sortie authorization. This level was part of the COMMANDO HUNT V plan for the dry season campaign in Laos. Although the plan put approximately two-thirds of the U.S. air effort into interdicting the Ho Chi Minh Trail, the planners provided for the minimum needs of BARREL ROLL. In briefing

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the Joint Chiefs of Staff on COMMANDO HUNT V, the 7AF Operations Plans
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briefer said:

We then looked to the BARREL ROLL area of operations. We used Ambassador Godley's forecast that this dry season a holding strategy will be pursued, with no major offensive thrust by the guerrillas. We are therefore allocating a minimum number of U.S. sorties.

Our plan calls for 30 U.S. sorties a day, or approximately 900 a month. The capability of the Lao T-28s and the increasing area coverage of the AC-47 will be of significant importance. We estimate that the Lao force can generate 3000 sorties a month, 2000 of which are allocated to BARREL ROLL. The 900 U.S. sorties planned amount to six per cent of our weight of effort.

To allay fears that the needs of BARREL ROLL could not be met if the enemy proved more aggressive than expected, the briefing for the JCS continued:

To arrive at a division of our available sorties among the various tasks that must be performed, we considered the priority of each task, the level of enemy activity in each target category, and the amount of force required to meet objectives. We applied no hard parameters, for we have confidence in the demonstrated responsiveness of the tacair control system and the flexibility of airpower to shift emphasis as the situation demands.

The reduction of sorties in BARREL ROLL without a lessening of objectives made it apparent that the quality of each airstrike applied would have to be improved. This resulted in more careful selection of targets, use of ordnance new to the area, and the introduction of innovative strike procedures. A highly effective procedure teaming the

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Army's OV-1 Mohawk as a hunter with the USAF's AC-119 gunship as a killer contributed to a significant increase in the truck kill rate. In an effort to save sorties by focusing on more certain targets, a Quick Reaction Force (QRF) of F-4s was established at Udorn. The QRF provided a fast response to troops-in-contact (TIC) situations and the discovery and destruction of lucrative targets that might otherwise escape. Better accuracy and greater destruction of targets was sought by greater use of Mark 82 bombs with the Snakeye high-drag fin structures which were being widely used in South Vietnam, and introduction of the larger fragmentation, higher velocity CBU-38 bomb unit. Ground radar-directed delivery techniques for bombing during night and weather conditions were introduced as a means to deny the enemy respite during dark or cloudy periods. Also, as the wet season closed, it was apparent that a stronger role was emerging for Headquarters 7/13AF at Udorn.

All of those developments that occurred in the air war over Northern Laos during the 1970 wet season are treated in the second chapter of this report. Some, of course, were old procedures tried again, some used for the first time in BARREL ROLL, and some innovated from scratch (again) by planners on a one-year tour in SEA experiencing their first wet-season campaign.

GROUND WAR IN NORTHERN LAOS

By early 1970, several patterns had become apparent in the ground war in Northern Laos. Friendly forces normally advanced in the wet

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season. They had the mobility of U.S.-provided airlift and were backed by close air support. The enemy's moves were impeded by muddy and washed-out roads and trails rendered even less usable by air interdiction, and in a fight he had no tactical air to call upon for help. Enemy forces usually advanced in the dry season. Roads and trails became firm, were repaired, and allowed his numerically superior army to advance and bring forward or reposition artillery, tanks, and supplies. Another pattern that emerged was that in the wet season U.S. tactical air resources were more easily obtained for BARREL ROLL targets. In the dry season, when the need to stop the enemy in Northern Laos was greatest, the need to interdict supplies moving down the Ho Chi Minh Trail for South Vietnam was also greatest and had a higher priority.

The reliance of General Vang Pao and his Special Guerrilla Units (SGU) upon air power continued to be apparent. Airlift gave them their ability to make surprise assaults, and aerial reconnaissance found the location of enemy troops and weapons. Heavy firepower by air preceded SGU attacks and held the enemy away when fighting decreased or became static. Airpower provided General Vang Pao the only means by which his 3000 to 6000 man force was able to mount offensive campaigns. The most recent was the 1969 wet season offensive against a better equipped, more experienced NVA force of an estimated 16,000 men. ^{11/}

During the 1969-1970 dry season retreat following General Vang Pao's highly successful offensive Operation ABOUT FACE, the "guerrilla force

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with air superiority" ^{12/} displayed its lack of ability to exploit air power in a defensive campaign. Trained by CAS primarily for an offensive role, the guerrillas did not make the phased withdrawal that would have forced the enemy to mass, thereby creating targets for airstrikes. Some U.S. officials could understand that General Vang Pao could not afford the additional losses of a stand-and-fight strategy. After more than eight years of fighting, he had experienced a steady attrition among his guerrillas, and morale was low. USAF commanders were concerned that the opportunity to strike the enemy as he massed for attacks was lost. ^{13/}

One stand was made at Phou Nok Kok, however, where the enemy lost 600 to air, but later the guerrillas lost the PDJ and retired for another defensive stand at their stronghold, Long Tieng. The withdrawal was ^{14/} supported by air, and friendly losses were light.

The enemy attacks at Long Tieng on 17-21 March stalled just short of the village, and once again the guerrillas moved back to the offensive. Among U.S. officials there was much speculation as to why the enemy did not take Long Tieng when it was obviously within his capability to do so. Some felt that the NVA's inflexibility was demonstrated when it surged to the edge of Long Tieng but appeared to lack instructions from Hanoi for the next step. One view was that possibly the NVA had achieved its objective by bloodying General Vang Pao's nose. Others felt that the enemy just did not want to pay the price. His supply line was long and was being battered by air, the guerrillas were reinforced by Lao and Thai ^{15/} Army battalions, and the wet season was only weeks away.

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In the last two days of March, friendly units were able to reoccupy Sam Thong and seize the dominant ridge line between Sam Thong and Tha Tam Bleung. This slight advance pushed the enemy back to a point approximately six miles from Long Tieng and "represented the first Government successes in MR-II in several months."^{16/} (See Figure 1.)

Throughout April and May, action centered around the Sam Thong to Long Tieng to Phou Pha Xai triangle and at Bouam Long, Lima Site (LS)-32.

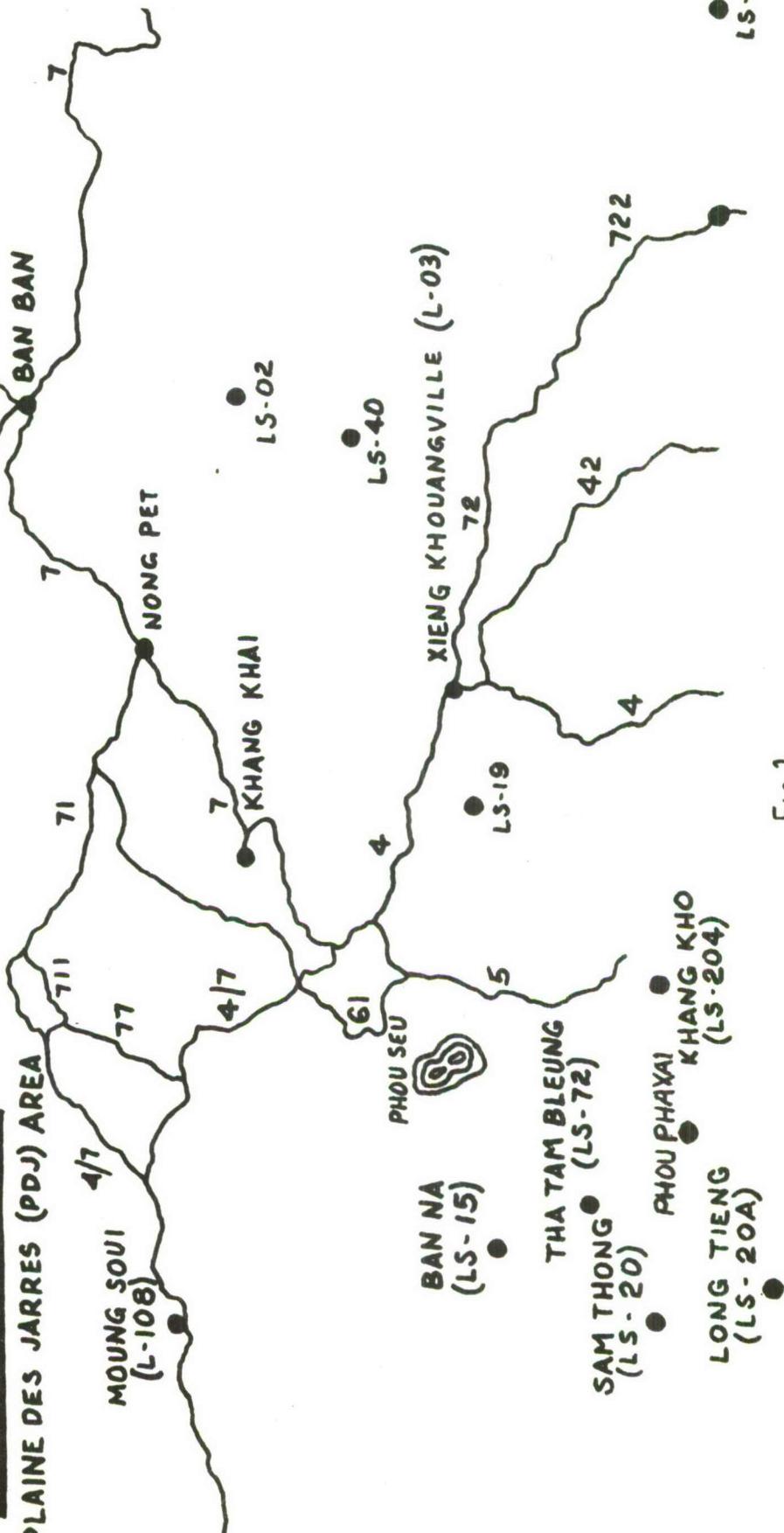
General Vang Pao's force of 6000 guerrilla and Forces Armee Royale (FAR) soldiers, pushed out from the Sam Thong to Long Tieng perimeter to retake the Tha Tam Bleung valley and LS-72. Until the end of May, action in the area was generally characterized by clashes and probes by both sides and frequent rocket and mortar attacks against Sam Thong, Long Tieng, and their airfields. At Sam Thong on 12 April, a three-hour enemy attack resulted in friendly casualties of 26 killed and 28 wounded while the enemy lost 41 killed.^{17/} A hill one kilometer northeast was swapped back and forth, and U.S. Attaches began to wonder if Sam Thong could withstand the enemy's siege-like tactics.^{18/} Another major action was the loss of five guerrilla outposts north of Sam Thong on 17 May.^{19/} A battalion moving from LS-72 to retake the lost outposts almost gained their objective before being attacked. Losses of 36 killed, 70 wounded, and 113 missing forced the battalion to withdraw. This action continued through most of the remainder of May--a period when weather was hampering the use of USAF air support.

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MAP of PLAINES DES JARRES
AREA



PLAINES DES JARRES (PDJ) AREA



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Fig 1

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At Bouam Long, 800 self-defense guerrillas led by General Vang Pao's father-in-law successfully held off units of the NVA's 312th and 316th ^{20/} Divisions and part of a separate regiment, equipped with DK-82s, 57mm recoilless rifles, and a 105mm howitzer. (See Figure 2.) Protection from air attacks was afforded the large-bore weapons through the employment of effective concealment methods. Throughout most of April and May these guns supported the attack and when they finally went silent in mid-May, it was not known whether air strikes had finally gotten them or ^{21/} ammunition was depleted. During this siege, much of the RAVEN-controlled air support was directed to support friendly troops in the almost daily TIC situations. Box Score 20, a target area established for random bombing of a delineated area in weather conditions, was established over the concentration of NVA attacking from near Moung Seng. The siege of Bouam Long was finally broken after reinforcement and replacement battalions of FAR were airlifted into the site. The friendly forces at last began pushing ^{22/} the enemy to the south and west.

In April, as General Vang Pao began to prepare for the offensive, speculations concerning the enemy's intentions were anything but optimistic. In mid-May the enemy was as far west as he had ever been at that time of the year. Some felt that the enemy would press to take LS-50 and LS-32. Having already taken LS-206 and LS-231, he could then secure the north rim of the PDJ, and by holding what he had of the southern PDJ, he would ^{23/} be in an excellent position for the next dry season offensive.

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Also in mid-May, estimates regarding what General Vang Pao's wet season offensive would accomplish were also pessimistic. The enemy was falling back slowly despite shellings and tactical air bombardment. As the first indications of the rainy season moved into the BARREL ROLL, the Attaches at Vientiane noted, "Few people have hopes for an RLG normal wet season offensive after the beating they have been taking over the ^{24/} last six months."

As the SEA monsoon shifted from a northeast to southwest flow, the resulting rains slowed the ground war in Northern Laos almost to a halt. Through June and July, reports from the area were summarized with words such as "...scattered probes and clashes..." "MR-II was quiet," and "No gains for either side." The few rains which helped clear the haze around Long Tieng in March and thereby abetted air strikes, were by midsummer daily and torrential. Air activity was greatly reduced by thunderstorms, fog, and low stratus clouds. For the week 11-16 June in MR-II, the RLAF T-28s flew only 35 sorties and were forced to stand down four of the ^{25/} seven days. RAVENS worked only 49 USAF sorties all week. For the week 16-22 July, Long Tieng RAVENS flew half-day schedules on three days and not at all on two days. On the one day weather did not impede operations, it was apparent air support was still needed: The T-28s ^{26/} flew 58 sorties and USAF added 24 strikes in the area.

With the RAVENS' control and recce activities limited by bad weather, they found themselves in the unaccustomed role of fire adjusters for

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Photograph of Bouam Long, Laos
(Lima Site-32)

FIGURE 2

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General Vang Pao's artillery, and thereby helped to sell the effectiveness of artillery to RLG ground commanders. In the first week of August, RAVENS directed over 205 rounds from one 105mm battery and over 400 rounds from another. Target objectives were to harass and interdict threatening enemy units. The Attaches noted an important side benefit:

By simply firing the artillery, the friendly forces, through greater familiarization, will hopefully accept the artillery as a valuable tool and will gain confidence in its use and effectiveness; and thus, eventually, will rely on artillery to perform certain types of tasks, particularly providing support when adverse weather precludes air strikes.

General Vang Pao later became so impressed with the effectiveness of his artillery, that by the end of the wet season he was including artillery support plans with battalion operations orders for the first time.

In August, General Vang Pao launched Operations LEAP FROG, a drive to secure the area around Ban Na (LS-15), an airstrip on the high ground 10 kilometers southwest of the PDJ. The offensive was planned to begin about the third of August. ^{29/} The RAVENS were used extensively for visual reconnaissance and to locate suitable helicopter landing zones (HLZ) for troop airlifts. Once the operation began, plans called for the use of artillery and RAVEN-directed air strikes to keep the enemy off balance. (See Figure 3.)

LEAP FROG was held back by a combination of reverses in the ground fighting and weather that precluded air strikes. On one night a series of enemy mortar, ground, and sapper attacks on a friendly artillery position

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five kilometers south of Phou Long Mat resulted in guerrilla losses estimated at 33 killed, including the commander and forward air guide (FAG), and 59 wounded. After losing the position, the guerrillas lost ^{30/} an additional 19 killed and 35 wounded attempting to retake it. During one week, USAF air strikes were limited by weather to four days with only ^{31/} 36 sorties and 82 RLAF T-28 sorties flown for the seven-day period. When an HLZ was finally established northwest of Ban Na, successive enemy attacks and lack of weather conditions suitable for friendly air support resulted in the guerrillas abandoning the HLZ. Dividing into two groups, ^{32/} the guerrillas retreated north and south.

The failure to achieve objectives around Ban Na was followed by an almost accidental success at Moung Soui (L-108) and a new designation ^{33/} for the offensive--Operation COUNTERPUNCH PART II. During the night of 31 August, a patrol from a force operating east from Xieng Dat (LS-26) advanced to the eastern edge of the Moung Soui airfield encountering surprisingly little resistance. After an initial engagement, both sides were reinforced and the contingent of troops from Xieng Dat expanded to approximately 500. A force moving south from Phou Fa (LS-16) raised friendly troop strength to 950. Although Moung Soui was defended by fewer enemy than expected, their counterattacks twice drove the guerrillas ^{34/} approaching from the west back to Xieng Dat. RLAF and USAF air were still constrained by weather in this critical period. A month of intense fighting showed that the enemy wanted to keep Moung Soui, but on 11 October ^{35/} the guerrillas took their objective. (See Figure 4.)

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Photograph of Ban Na, Laos
(Lima Site-15)

FIGURE 3

Approximate Scale in Meters
0 100 200 300 400 500



Photograph of Mount Soui, Laos
(Lima Airfield-108)

FIGURE 4

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Moung Soui had been a Lao Neutralist headquarters when the lines of the 1962 Geneva Accords had been agreed upon. To reestablish Neutralist influence in the area, Forces Armee Neutre (FAN) units were ordered into the area.^{36/} The guerrilla force then made ready to move south toward Ban Na.

Operation COUNTERPUNCH PART II was intended to secure Ban Na and to take the high country along the west rim of the PDJ. The three axes of attack were planned to be south from Moung Soui, north from Phou Long Mat, and northwest from Khang Kho (LS-204).^{37/} The Khang Kho contingent had just completed a successful infiltration to destroy a supply complex on Route 4 east of the PDJ. Leaving Khang Kho, this guerrilla force advanced rapidly to secure Moung Pot, Moung Pang, and the twin peaks of Phou Seu, allowing long-range observations of the PDJ. The Moung Soui and Phou Long Mat contingents, the latter including a FAR battalion, also began to gather momentum and discovered large quantities of rice, ammunition, and personal equipment. The Moung Soui force was able to capture mortars, recoilless rifles, and small arms. The loss of supplies was cause for at least some of the enemy to leave their positions. By 23 October, the Moung Soui area was secure, the west rim of the PDJ was held, and Ban Na was finally taken.^{38/} It was apparent that the enemy had wanted to hold Ban Na as a point from which to launch his dry season offensive.

At the time of cut-off for this report, 1 November 1970, a date arbitrarily selected to identify the start of the dry season, the ground war in Northern Laos had ominous portents. Despite General Vang Pao's

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recent limited gains, the NVA still held pockets of resistance in the guerrilla's newly won territory. Truck traffic into the PDJ was increasing, and there were signs of troops and supplies building up in the PDJ center and eastern areas. But most damaging was the fact that the enemy's far west position was excellent for his anticipated dry season offensive. The wet season offensive by General Vang Pao's guerrillas and FAR units had pushed the enemy back only 30 kilometers.

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CHAPTER II

FEWER SORTIES BETTER APPLIED

Withdrawal was apparent in the air war in Northern Laos in the wet seasons of 1970. The A-1s at Nakhon Phanom were reduced from three squadrons to two, from authorization for 75 aircraft to 50.^{39/} The sixty F-105Ds flying tactical strike missions from Takhli were returned to the States and the base prepared for closing. But of greatest significance was the new limit of fighter-attack sorties to be flown by the aircraft that remained, and almost as important to the friendly ground forces in MR-II was the proportion of these sorties allocated to the BARREL ROLL area. In April, as the wet season began and General Vang Pao slowly moved out from Long Tieng, a weekly average of 700 USAF strike sorties was provided.^{40/} By the end of the season, a limit of 10,000 fighter-attack strike sorties per month was imposed on all SEA. Of these, Northern Laos was allocated 30 sorties per day, or approximately nine percent.^{41/} These limits were established in accordance with the COMMANDO HUNT V plan to concentrate on the Ho Chi Minh Trail and with full recognition of the ability to shift tac air effort to BARREL ROLL if emergencies arose. The overall need for tactical air support in Northern Laos continued as the sorties were reduced. Half of the territory of the country was controlled by the Communists.^{42/} The RLG was continuously threatened by the NVA presence and had suffered a crisis when Long Tieng's fall appeared imminent.^{43/} General Vang Pao's wet season offensive was to be later characterized by one Intelligence Officer as a holding action victory for the NVA, and the

[REDACTED]

depleted Meo guerrilla army was suffering the effects of over two years
of almost continuous contact with the enemy. 44/

Fewer sorties against an undiminished threat meant that each sortie flown would have to be more effective.

THE HUNTER-KILLER TEAM

Gunships made a significant contribution to the tac air interdiction effort and support for ground forces provided in Northern Laos in the 1970 wet season. The RLAF AC-47s flying from Luang Prabang and Vientiane and the Udorn-based USAF AC-119s provided significant fire-power to counter the enemy's nighttime probes and attacks and to destroy his trucks. The AC-119s generally flew schedules that kept one of the gunships available to the friendly forces throughout most of the night while otherwise attempting to find and destroy trucks. As COMMANDO HUNT V went into effect at the close of the 1970 wet season, the limitation on fighter-attack sorties excluded the USAF gunships.

One way in which gunship sortie effectiveness was increased was by the introduction of the OV-1 "Hunter" and the AC-119 "Killer" working as 45/ a team to kill trucks as part of BARREL ROLL interdiction. The OV-1s used SPUD as a call sign and were stationed at Udorn on detached duty from the 131st Aviation Company at Phu Bai, RVN. The OV-1 Mohawks were equipped with either side-looking airborne radar (SLAR) or infrared (IR) heat-detecting devices. The AC-119s had STINGER for a call sign and were also on temporary duty at Udorn. As Igloo White sensors were not available the OV-1's SLAR was used to find truck targets and to pass their locations

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to the AC-119, permitting the gunship's limited time over target areas to be used much more productively. In the one month of extensive operation prior to the full onset of the wet season, the truck-kill rate of the ^{46/} team more than doubled the rate of a gunship operating alone.

The idea for the Hunter-Killer team was developed by the Intelligence Officer assigned to the Army Attache (ARMA) in Vientiane but working as a liaison officer with Headquarters, 7/13AF at Udorn, and by the OIC of the pilots flying the OV-10s at Udorn. The primary objective of both officers was to use the specially equipped OV-10s to gain intelligence on enemy concentrations and enemy movements for ARMA. By working with the 7/13AF Director of Current Operations, the two Army officers developed a plan to integrate SLAR's near real-time target identification capability-- a five to seven minute processing and interpreting delay was involved-- ^{47/} with the destructive power of a gunship working in the same area. The role of monitoring enemy truck traffic for the U.S. Army was undiminished, and to everyone's satisfaction the trucks and their cargoes were destroyed at an increased rate by the USAF.

There were, of course, problems to overcome. Many nights as the two aircraft began operations the enemy commenced several simultaneous ground actions. They knew that the priorities for gunship use placed support for TICs above truck-killing. This problem was relieved by putting one gunship on truck-killing as its sole mission. Maintenance of the SLAR equipment at Udorn--a base far removed from the OV-10s' home station at Phu Bai--

was a problem, but lessened somewhat as time passed and experience was gained. Problems also arose from the bi-service aspect of the team. In ^{48/} the words of the ARMA Intelligence Officer at Udorn:

It was a thousand intangible things. They were Air Force and we were Army. There were problems getting Air Force crews to believe the intelligence we made available, which with new SLAR operators was sometimes incorrect, and there were problems convincing Seventh Air Force that the truck-killing effectiveness of the Hunter-Killer operation warranted an increase in aircraft assets. The AC-119 force was finally increased, but we never received the badly needed second SLAR OV-1.

The effectiveness of the team was proven in the first month of ^{49/} operation. On the first night, 27 April, the score was four trucks destroyed and two damaged. The next night their score was nine destroyed and four damaged. By 25 May the team had worked together only 14 nights and accounted for 41 trucks destroyed and 19 damaged. Also, 10 trucks were struck with results not observed. It was significant that of the 15 nights team operations did not occur due to maintenance, weather, or TIC diverts, nine nights were lost due to SLAR problems. Home base support of the equipment would undoubtedly have raised the month's kill rate. The success that was achieved, nonetheless, was praised by the Deputy Commander, 7/13AF, as "highly successful" and constituted "an increase ^{50/} of over 60 per cent above normal truck destroyed/damaged rates."

THE QUICK REACTION FORCE

On 27 May 1970, a quick reaction force (QRF) of F-4s was established ^{51/} at Udorn. The force was fragged to stand by each day to respond to

RAVENS or other FACs who had discovered lucrative targets, or to ground force forward air guides (FAG) with General Vang Pao's army who requested support for troops in contact.^{52/} Such needs had previously been filled by diverts from the numerous flights operating in the area when a high daily sortie rate allowed the luxury of diverting aircraft. Also, the practice of scheduling aircraft and then simply flying that schedule could no longer be considered optimal when there were fewer good targets and fewer sorties. The Udorn QRF used FALCON for a call sign and complemented the Ubon WOLFPACK QRF used over the Laos panhandle. (See Figure 5.)

Day by day experimentation ultimately determined the size, ordnance, schedule, and employment techniques of the Udorn QRF.^{53/} Initially six aircraft were put on alert, but the number quickly rose to 12. Quick reaction precluded last-minute ordnance changes, so selections of bombs, fuses, and special ordnance were fragged to give the force, and to an extent each aircraft, a degree of flexibility. One fairly standard load that resulted was six 500-pound bombs, half with fuse extenders, and four CBU-24s. Variations included four Rockeyes or possibly high-drag bombs, napalm, or the newly introduced CBU-38s.

The force was on alert as of 0600 hours daily and was available over a BARREL ROLL target within one hour. Typical elapsed times were 23 minutes from time of call for the QRF until it was airborne and 20 to 25 minutes enroute to the target. The early reporting time for crews and the probable mission duration time caused replacement crews to be scheduled in the afternoon so that crew duty time limitations were not exceeded.

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A QRF launch resulted after a series of procedural steps were taken involving Intelligence and Control agencies at widely separated locations. ^{54/} Typically, a RAVEN FAC might spot a reveted bulldozer adjacent to a route on the PDJ. The RAVEN then passed target information to CRICKET, the Airborne Battlefield Command and Control Center (ABCCC) C-130 orbiting overhead. The information was passed to BLUECHIP, Seventh Air Force's Command Post, where the decision to launch a QRF flight was made. BLUECHIP then simultaneously notified Udorn which flight of F-4s to launch and passed the flight's call sign and ordnance information to CRICKET for relay to the RAVEN, who still remained in the target area.

An effective variation occurred when BULLWHIP Udorn's morning RF-4 recce flight, was able to get stereo photo coverage of a target. ^{55/} By quick processing and photo interpretation, and target verification by a LAREDO FAC, a QRF crew could be briefed from the film strip before take off. One refinement was to provide pilots with marked Polaroid photos of the target area film strip.

The QRF program did have some disadvantages. Normally eight or ten F-4s were tied-up to fulfill a 12-plane alert commitment--some aircraft used early could be rescheduled for afternoon alert. Despite achieving a healthy frag rate, flying time rates appeared low when several F-4s of the force were not used. Aircrews had their usual dislike for the tedious hours of waiting which began with briefings and preflight inspections long before dawn. As a result of achieving flexibility of ordnance by aircraft

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F-4 armed with napalm and 500# bombs with high-drag fins, on QRF alert at Udorn RTAFB.

FIGURE 5

and throughout the force, the load for a particular close support mission was often not the optimum.

The success of the QRF more than offset the disadvantages. The concept had become mandatory if an all-day close air support capability for Northern Laos was to be provided as the sortie allocation dropped. A strike by QRF on 30 July was an example of how effective the force could be. ^{56/} A LAREDO FAC found a truck park and storage area in the Banana Karst section of Route 7. Through ABCCC he secured the assistance of two divert flights and three QRF flights. The results: 12 trucks destroyed, two trucks damaged, two POL dumps destroyed, 16 large secondary explosions, two 37mm guns damaged, 12 medium secondary explosions, and four sustained fires.

SNAKEYES IN LAOS

As the force of highly accurate A-1s used for close air support in Northern Laos was reduced, a means of achieving highly accurate delivery of bombs from fast-moving jets was required. Snakeye high-drag fins on Mark 82 500-pound bombs was the means to achieve this goal. Configured with the fins, a bomb could be delivered from a jet with pin-point accuracy on targets within approximately 300 feet of friendly troops in contact with the enemy. ^{57/} The delivery technique usually required that the bombs be dropped from an aircraft flying 450 KCAS at about 600 to 1000 feet above ground level (AGL). Unlike Vietnam, where Snakeyes were commonly used, the target areas in Laos were usually well-defended by antiaircraft artillery (AAA) and automatic weapons (AW). Low-altitude bomb deliveries

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incurred considerable risks. The decision to use Snakeyes in Northern Laos was made by Seventh Air Force only after repeated requests by the ^{58/} RAVENS and considerable discussion among the Thai-based wings and ^{59/} Headquarters 7/13AF. (See Figure 6.)

Use of the Mark 82 with high-drags was proposed by 7/13AF at the BARREL ROLL Working Group meeting at Udorn on 31 August. The proposal called for the Udorn QRF, and other bases and forces as required, to be equipped with Snakeyes. The rationale was that the high-drags afforded the accuracy required for TICs and would help offset the decrease of A-1s. They would be used in a VFR, permissive environment and could be used at the discretion of flight leaders who also determined the tactic to be used. A great deal of discussion by the Wings, 7/13AF, and AIRA preceded the decision to support the proposal and pass it on to Seventh Air Force. The representative from the Udorn wing felt that the risks were excessive and that Snakeyes on QRF aircraft would generally tie up F-4s for several days until a TIC situation appropriate for high-drag bombs ^{60/} developed. Some wondered if General Vang Pao could be sold on any kind of close support bombing from high-speed jets. On the other hand, the wing representative from Korat favored getting aircrews qualified with the ordnance before nose-to-nose TICs made its use mandatory.

Seventh Air Force subsequently approved the use of Snakeyes for TICs in Northern Laos. By the end of the wet season, low-altitude Snakeeye ^{61/} deliveries resulted in some F-4s being hit although none were downed.

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High-drag fins (Snakeye) on 500# bomb.

FIGURE 6

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The first highly effective use of the ordnance took place in September in the southern Laos panhandle where a site on the southeast rim of the Bolovens Plateau was successfully defended against enemy onslaughts that ^{62/} were riddled by Snakeye-equipped F-4s from Thai bases. Until the end of the wet season, high-drags continued to be used throughout Laos.

THE CBU-38

A new cluster bomblet unit was introduced into Thai-based fighter operations during the 1970 wet season. The CBU-38, an area weapon with larger fragments, greater fragment velocity, and more incendiary effect than previous fragmentary weapons, was used in a test program labelled ^{63/} COMMANDO RING. (See Figure 7.)

The test was initially hampered by weather problems and difficulties in getting suitable targets struck by aircraft carrying CBU-38s. Suitable targets were trucks, boats, bulldozers, stored materiel, and antiaircraft weapons. The requirements of the test made it highly desirable that appropriate targets be struck and that post-strike photography and analysis be made. Two hundred of the weapons were used in the test that ran from ^{64/} 5 October until 30 November 1970.

Each aircraft in the test was hung with three CBU-38s, which, with 40 bomblets in each canister, could cover an area 800 feet by 100 feet with 120 explosions if a level bomb run at 450 KCAS at about 1300 feet AGL was flown. Ejection of all bomblets from the canisters took a two-second activation of the "pickle" button. A one-second activation ejected

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about half the bomblets and was a technique the pilots favored to avoid an excessively long pattern and to allow a second run on the target. Pattern concentration was also achieved by a 45-degree dive delivery with release at 6000 feet AGL. The resulting bomblet coverage was then about 150 by 300 feet. ^{65/} (See Figure 8.)

Some crew problems in employing the CBU-38 were apparent at first but were corrected as more crews gained experience in its use. An unusually high mil setting for the sight caused pilots to start dives which proved to be too steep, required adjustments during the dive, and resulted in slightly short deliveries. On more than one occasion improper ordnance selection switch settings resulted in the jettison of the canister ^{66/} instead of just the bomblets.

The CBU-38 proved to be an ordnance that contributed to increased effectiveness for the sorties authorized in Laos. Besides being an improvement over previous CBU anti-materiel area weapons, it had the highly desirable feature of using a canister, worth about \$1400, that was retained ^{67/} on the aircraft and was reuseable. (See Figure 9.)

HOTSPOT: USE OF COMBAT SKYSPOT IN BARREL ROLL

Late in the wet season, ground radar-directed bomb deliveries joined airborne radar, TACAN, and LORAN as a technique for night or weather strikes ^{68/} in BARREL ROLL. The technique was named COMBAT SKYSPOT; its use in BARREL ROLL was labelled HOTSPOT. Basically the technique involved use of radar bomb-scoring (RBS)-type radar to control an aircraft to a target,

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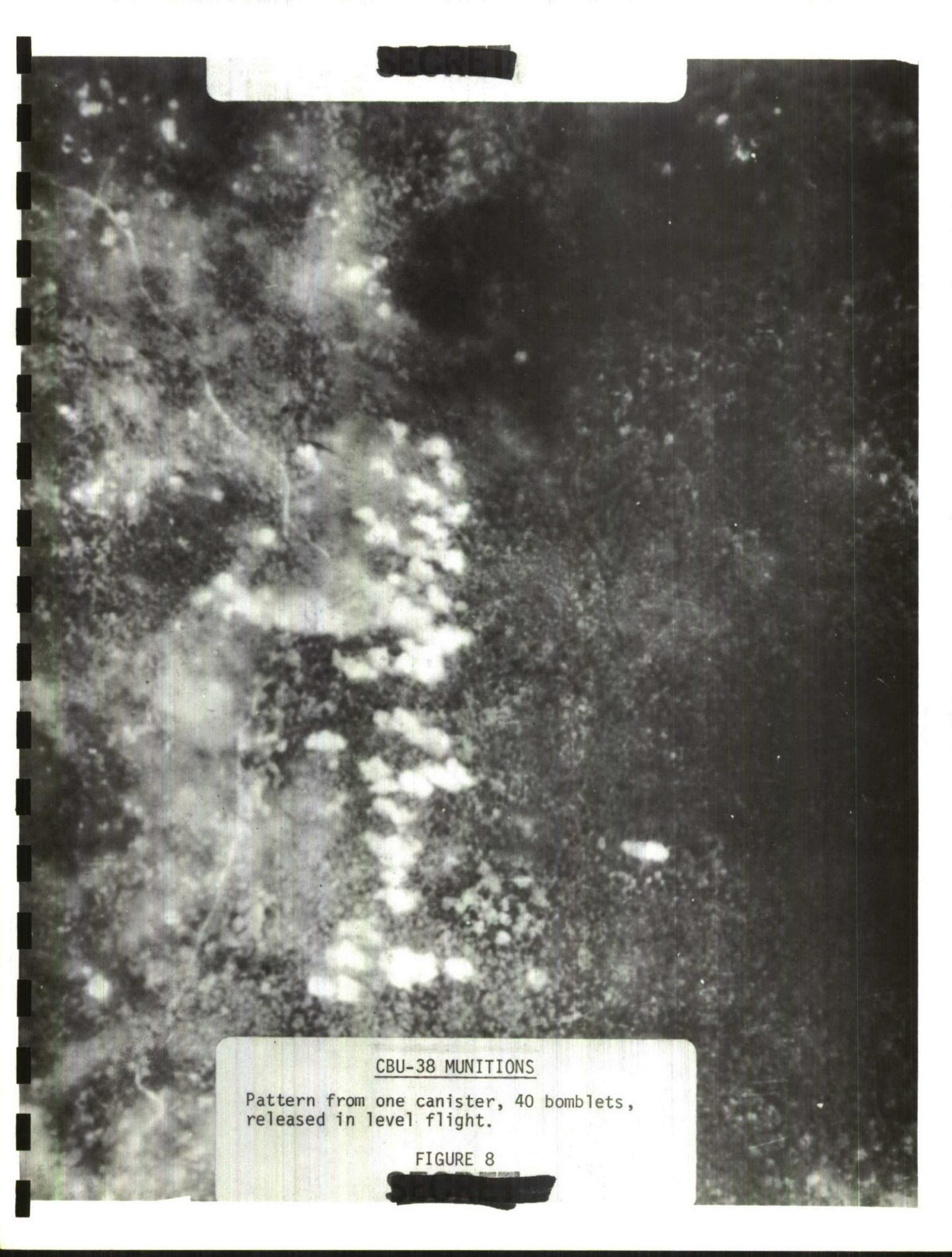


CBU-38 MUNITIONS

14# bomblets after downward ejection from canister, shown in upper right corner.

FIGURE 7

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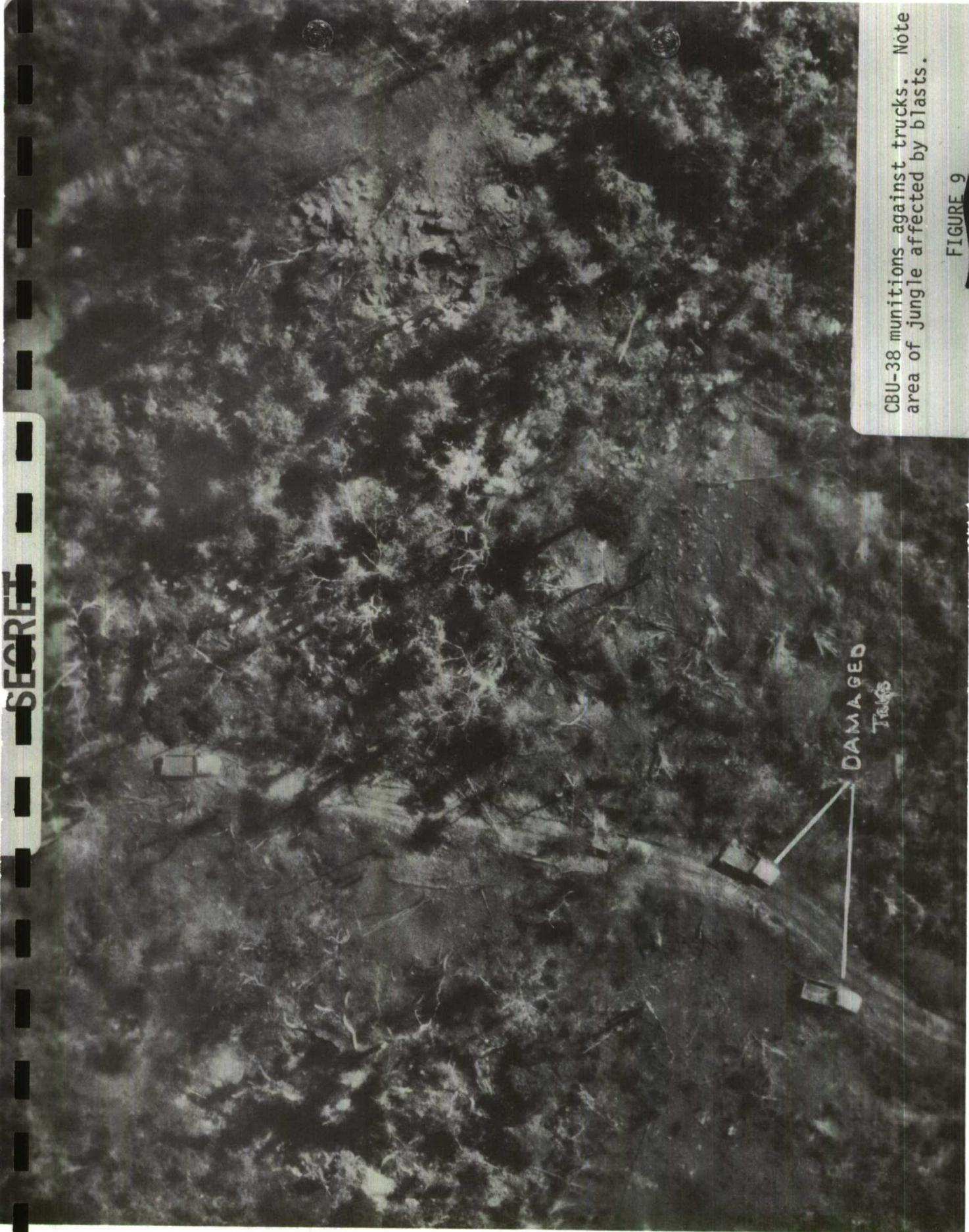


CBU-38 MUNITIONS

Pattern from one canister, 40 bomblets,
released in level flight.

FIGURE 8

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CBU-38 munitions against trucks. Note area of jungle affected by blasts.

FIGURE 9

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and then the radar controller gave the pilot a count-down for bomb release. The system had already been used in SEA to control SAC bombers and fighter-bombers over the Lao Panhandle and RVN, but an improved system, the TSQ-96, was installed at Nakhon Phanom in February 1970, and was moved to Udorn in April. (See Figure 10.)

The TSQ-96 had a variety of features that were improvements over RBS systems like the older MSQ-77/TSQ-81 that remained at Nakhon Phanom. It was the first unit designed to be used as a bomb delivery system and not a "scoring unit used in reverse." The radar beam provided one-tenth of a mil accuracy and locked on to the aircraft being controlled. Two computers were used to accept, store, and apply information on targets, ballistics, and wind. Communications equipment provided at the Udorn TSQ-96 site allowed HF, VHF, and UHF ground-to-air communications, secure conversations with TACCs at 7AF and 7/13AF, ABCCCs on orbit, and B-52 aircraft. Recorders were installed to preserve each bomb run and the voice communications between pilot and controller in case a particular mission had to be reconstructed.

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Although the TSQ-96 was moved to Udorn in April, it was plagued with problems of antenna site preparation and, later, electronic interference. After considerable on-base trouble-shooting a technical representative from the equipment manufacturer arrived and found that the airborne radars of locally flown aircraft plus some incorrect wiring arrangements in the TSQ-96 were the causes of the problems. Finally, on 20 September the set

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was fully operational. (See Figure 11.)

By the end of the wet season, the TSQ-96's effectiveness had not been fully evaluated. For one thing, the improving weather of October resulted in less need for all-weather delivery techniques because ordnance could be delivered visually. Also, the total number of sorties was reduced in October so that BARREL ROLL was allocated only about 30 a day. Without a combat environment evaluation program, the accuracy of the set could not be compared with other all-weather delivery systems. To some extent the errors that were noted were due to pilots not being able to hold headings to within fractions of degrees and inaccuracies in the charts of the target areas. ^{71/} While inaccuracies resulting from aircraft heading variations could not be reduced beyond a point, chart refinements offered a means by which the greater source of error could, in the future, be reduced.

COMBAT SKYSPOT in BARREL ROLL suffered from a couple of other problems. Tactical fighter pilots disliked any weather delivery system because they didn't enjoy trucking ordnance to a spot, releasing it, and not being able to see resulting explosions. They disliked the amount of time each bomb run took and the one-flight (or formation)-at-a-time capability of the set and controller. Being predisposed against the technique, they also found it easy to remember and talk about the time-consuming aborted runs where radar lock failed or some other problem developed during the final seconds of count-down. ^{72/} Also, there were instances where ground forces in the

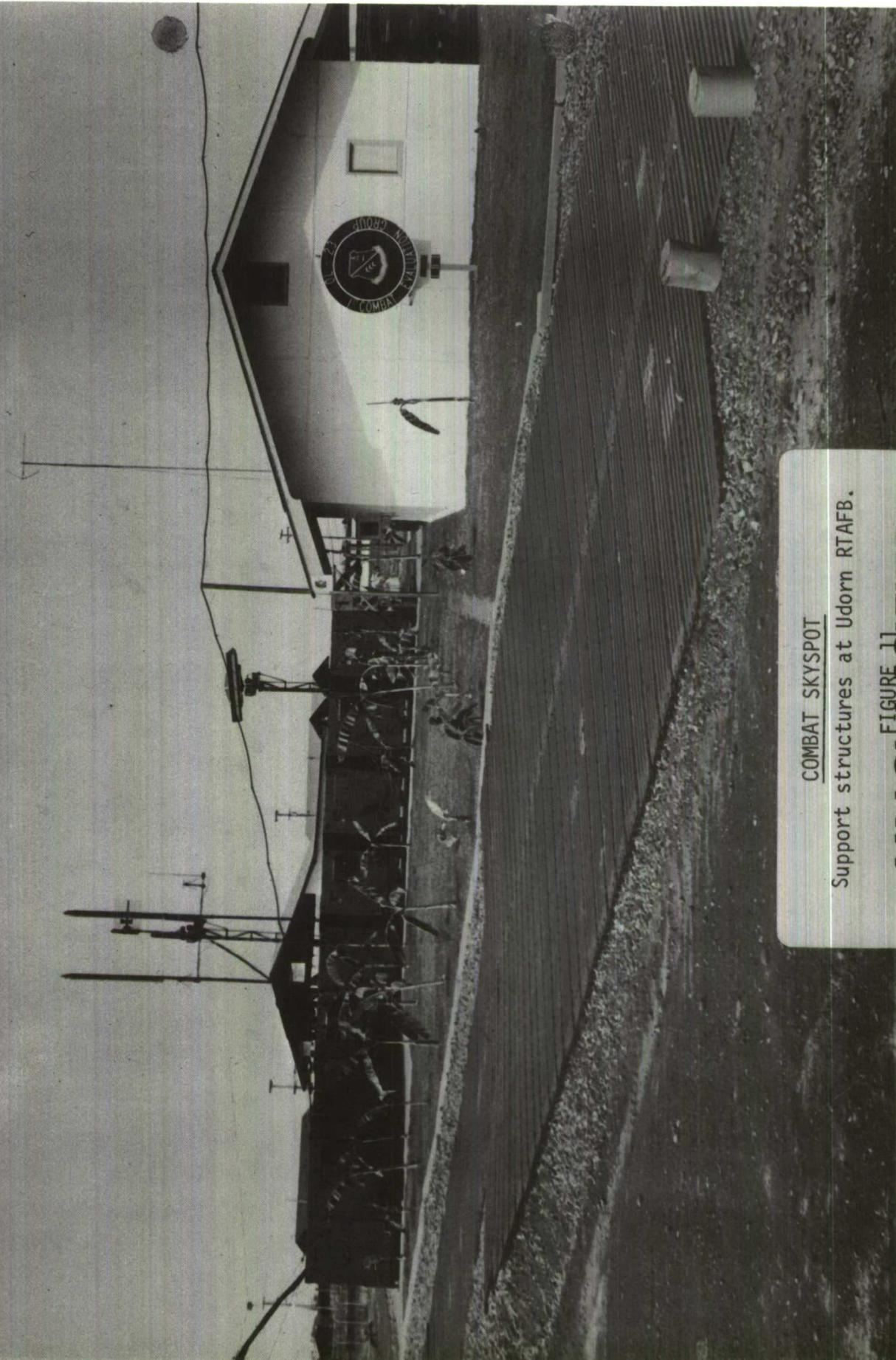
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TSQ-96 antenna at Udorn RTAFB.

FIGURE 10
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COMBAT SKYSPOT

Support structures at Udon RTAFB.

FIGURE 11
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target areas claimed that some of the bomb strikes were short rounds.

Despite investigations, delivery of short rounds by COMBAT SKYSPOT was never verified. One particular claim did, however, result in a temporary halt to the operation.

74/

The U.S. Embassy favored the continued use of the technique. Night and weather delivery of bombs on the enemy meant that there was no particular time at which, due to clouds or time of day, he was safe from tactical air strikes.

A CHANGE AT HEADQUARTERS, 7/13AF

As the wet season closed, it was evident that Headquarters, 7/13AF at Udorn was playing a more active role in how the air war was waged in 75/ Northern Laos.

One of the prime responsibilities of the Headquarters was to monitor the progress of each day's missions for 7AF and be prepared to assume control of all air operations in accordance with 7AF OPLAN 717, entitled 76/ Continuity of Operations. Additionally, the Headquarters was a point of contact with the U.S. Embassy at Vientiane and CAS Udorn for air support of the ground war in Laos and provided "command guidance" for 13AF's 77/ Thailand-based units. Lacking ultimate decision authority for 7AF or 13AF matters and possessing almost no operational control of forces, the Headquarters was not attuned to making dynamic impacts upon how the daily air war operations were conducted. Monitoring messages between Thailand-based wings and 7AF and 13AF was one of the time-consuming functions

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performed by the Headquarters staff. As the ground situation became more secure in Vietnam and the probability was reduced for Headquarters 7/13AF, to assume the role of 7AF's Command Post, a manpower survey recommended reducing the Headquarters manning from 176 to 137. Recommendations for target selection were drawn from AIRA, CAS, and reconnaissance squadron inputs and intelligence was drawn from AIRA and CAS sources to a great degree. Operations formulated plans and procedures to submit to 7AF that were initially proposed by Thailand squadrons and wings. Day to day monitoring, summarizing, and briefing responsibilities caused one officer in Operations to characterize duties in that section as "bean counting."

The combination of a new Seventh Air Force Commander and a new 7/13AF Deputy Commander greatly increased the activities of 7/13AF Headquarters personnel. With the arrival of Major General Andrew J. Evans, Jr. from a stateside assignment as Commander of the Tactical Air Warfare Center at Eglin AFB, the 7/13AF Headquarters had a Deputy Commander with considerable knowledge and experience in the development and employment of new tactical weapons. Many questions were asked of staff members at the Headquarters daily 0800 hours stand-up briefing. General Evans' response to many answers was a request for further information. Frequently he asked, "Why do we do it that way?" or instructed his staff to work up a new recommendation, a new plan, or a new procedure. He was particularly interested in the kinds of ordnance and tactics used and their appropriateness for the targets being struck. He ordered a review of how AIRA requirements were given to 7/13AF and how 7/13AF advice and support were given to AIRA.

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He urged his staff to build a more responsive relationship with AIRA and CAS so that U.S. air resources could be more judiciously applied in support of the Embassy mission in Laos. The staff responded with the additional hours and effort required to meet the General's challenges.

If any of the staff thought that the level of activity would subside after the General's orientation was completed or, as some said, "he realizes he doesn't really run the war," their views were short-lived. At the stand-up briefing of 26 October 1970, General Evans stated that General Clay at Seventh Air Force was looking to the Deputy Commander of 7/13AF for recommendations and positions on all matters regarding the Thai-based wings and support to Laos. General Evans then said that if something is done a particular way in Thailand, it would be because 7/13AF recommended it to Seventh Air Force, or at least that the higher Headquarters had full knowledge of the 7/13AF position on it. Clearly a wide-ranging review of USAF activities in Thailand had begun.

CHAPTER III

OUTLOOK

Overshadowing all political and military activity in Northern Laos throughout the 1970 wet season were the impending talks between Prime Minister Souvanna Phouma's Royal Laotian Government and Souphanouvong's Lao Patriotic Front (Pathet Lao). The possibility of negotiations had been triggered by both side offering proposals for ending the conflict in ^{78/} Laos. On 6 March 1970, after the NVA/Pathet Lao (PL) had reoccupied the PDJ, the Pathet Lao offered a five-point plan calling for: (1) a bombing halt and withdrawal of U.S. military advisors and supplies; (2) no military alliances or foreign troops in Laos; (3) free elections; (4) a provisional coalition government of all Lao parties; and (5) no encroachment by parties on areas controlled by another and resettlement of the population displaced by pro-American forces. Souvanna responded with a three-point proposal on 10 April 1970: (1) a ceasefire and withdrawal of foreign forces; (2) International Control Commission (ICC) supervision of the ceasefire and withdrawal; and (3) a meeting of interested parties to seek solutions based on Lao interests as opposed to the international interests of neighbors.

The proposals and counterproposals indicated a willingness to talk between the two parties, but some major obstacles remained to be overcome. The PL wanted to know if Souvanna's plan meant cessation of U.S. bombing the Ho Chi Minh Trail, Souvanna's reply: "That is a matter for the Americans to decide," presumably as a matter of concern between the

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U.S. and North Vietnam. The sparsely populated Laos eastern panhandle was, after all, of little strategic importance to the RLG. Also, Souphanouvong refused to enter into talks between the RLG and the PL. He did not recognize the RLG as represented by Souvanna to be the legal government of Laos. The four-member Pathet Lao representation in what was established in 1962 as a tripartite cabinet had stopped considering itself as part of that cabinet. ^{80/} Souvanna finally agreed that talks would be between spokesmen representing Souphanouvong and himself as leaders of political parties. By the end of the wet season, both sides had agreed to Khang Khai on the PDJ as the site for the talks, but the talks were still pending.

Whatever the outcome of the talks, U.S. airpower would be a factor. Souvanna had acknowledged in February 1970 that air support was saving Laos from a North Vietnamese and Communist takeover. In May 1970 the ^{81/} U.S. Ambassador, G. McMurtrie Godley wrote:

The tempo of the Laotian war continued to increase in 1969-1970 as the North Vietnamese increased the level of their military involvement in Laos to a new high of 67,000 or more men. Most remaining vestiges of earlier tacit understandings about cease-fire agreements and territorial control in relation to them went down the drain.

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Ambassador Godley further described the war:

The war was bigger and the margins for decision by the RLG were smaller . . . The Government had been forced to seek . . . more U.S. air support. Its authority and control over the internal

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situation were based on two predominant factors: the prestige of Souvanna Phouma and the resources and influence of the United States.

The areas of Laos claimed by the RLG and PL have been determined, in large measure, by the success of their respective ground military operations. The location of forces at the time talks were to begin would greatly influence each side's power to negotiate and to determine where lines were to be drawn if partitioning resulted.

That RLG and PL talks were even being considered was indicative of the success of U.S. air support to Laos. Pathet Lao progress toward talks required the approval of the pervasive NVA, for whom a new war in Cambodia and the U.S. withdrawal from SEA, made talks, and therefore time, more to their advantage. After years of advances and retreats in Northern Laos, the vastly stronger and better equipped NVA may have decided that their gains by arms had been incompatible with their losses to U.S. air.

As the wet season closed it was easy to be pessimistic about the war in Northern Laos. General Vang Pao's decimated guerrilla force had not achieved significant wet season gains. The NVA was still present in large numbers while the U.S. was scaling down its day-to-day air support. With the enemy beginning his offensive from the far west positions that he held, the dry season campaign could well prove to be the RLG's last. If the RLG were to fall, formal agreements partitioning the country into pro and non-Communist areas could mean the end of all hopes that Laos could serve as a buffer. The threat of Communism to Thailand would be considerably increased.

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29. (S/NF) JANAF Summary, 24 - 31 Jul 70.
30. (S/NF) JANAF Summary, 31 Jul - 7 Aug 70.
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35. (S/NF) JANAF Summary, 9 - 16 Oct 70.
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37. (S/NF) JANAF Summary, 9 - 16 Oct 70.
38. (S/NF) JANAF Summary, 23 - 30 Oct 70.
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41. (S/NF)
(S) Briefing by 7AF (DOC) at 7/13AF, 10 Oct 70.
PACAF, DOOF Ltr, 18 Mar 71.

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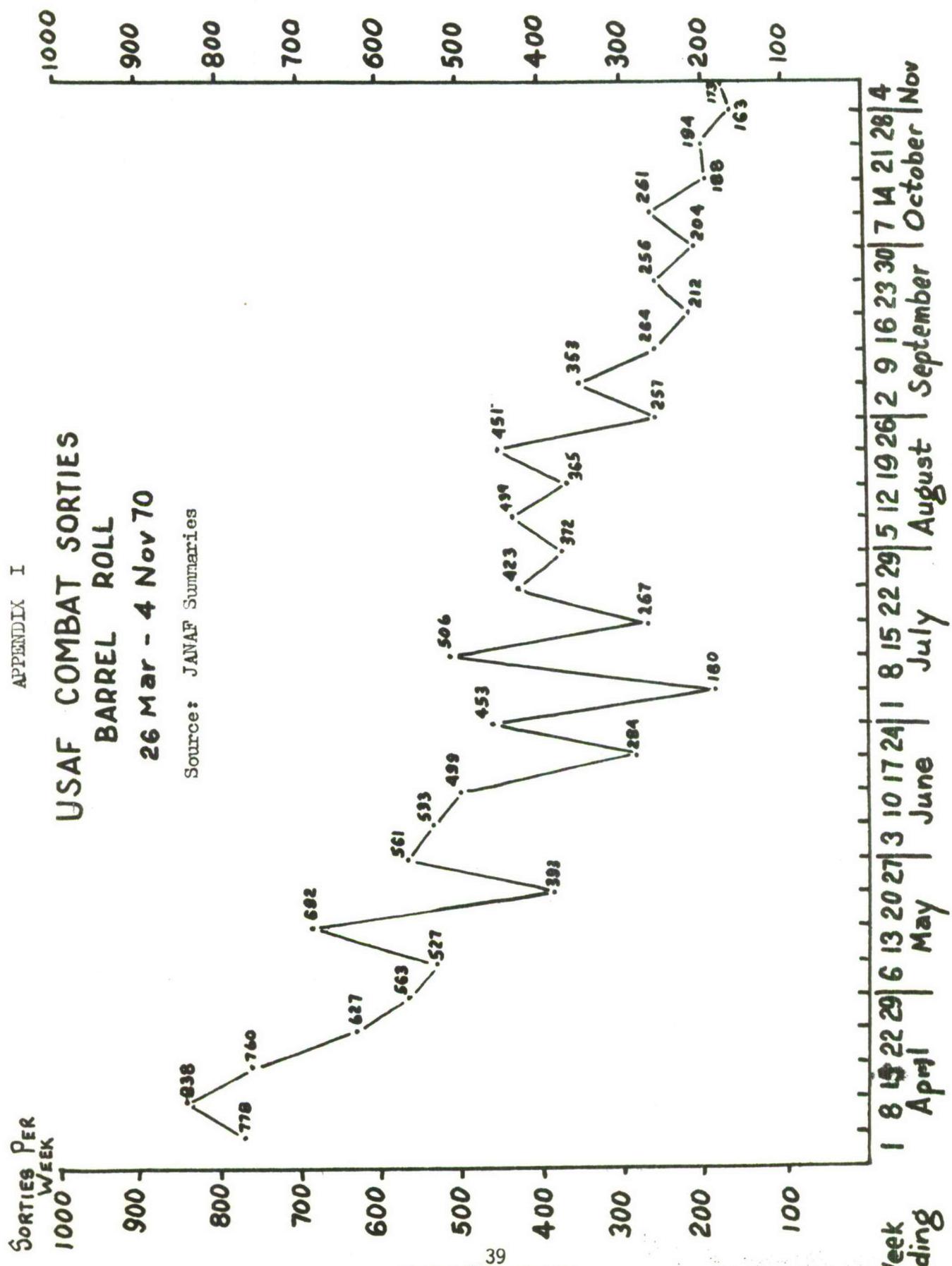
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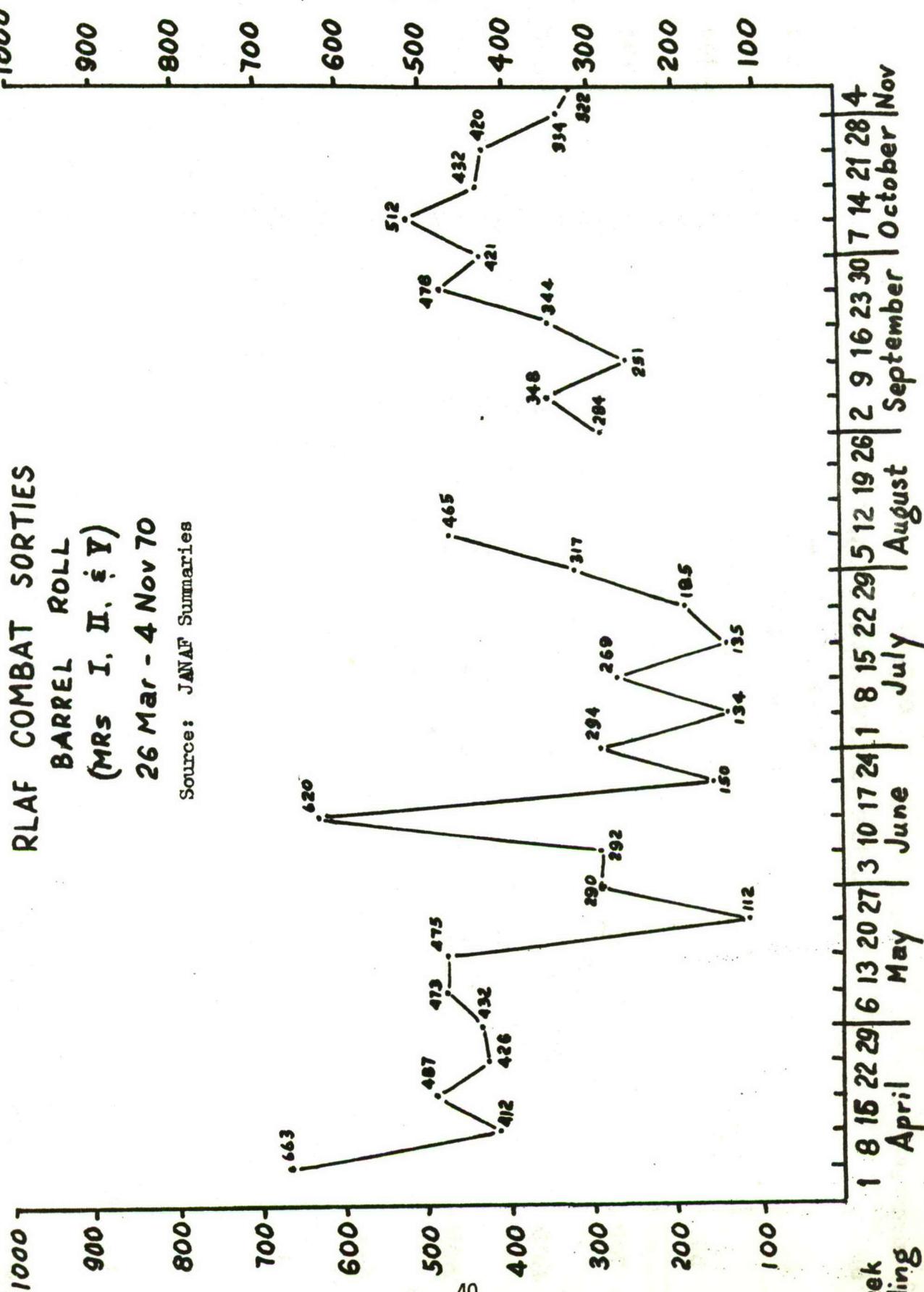
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APPENDIX I



APPENDIX II

SORTIES PER WEEK



Week ending

1 8 15 22 29 6 13 20 27 3 10 17 24 1 8 15 22 29 5 12 19 26 2 9 16 23 30 7 14 21 28 4

April May June July August September October November

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GLOSSARY

AAA	Antiaircraft Artillery
ABCCC	Airborne Battlefield Command and Control Center
AFB	Air Force Base
AGL	Above Ground Level
AIRA	Air Attache
ARMA	Army Attache
AW	Automatic Weapons
BRWG	BARREL ROLL Working Group
CAS	Controlled American Source
CBU	Cluster Bomb Unit
CHECO	Contemporary Historical Examination of Current Operations
CIA	Central Intelligence Agency
COMUSMACV	Commander, U.S. Military Assistance Command, Vietnam
FAC	Forward Air Controller
FAG	Forward Air Guide
FAN	Forces Armee Neutre
FAR	Forces Armee Royale
HF	High Frequency
HLZ	Helicopter Landing Zone
ICC	International Control Commission
IR	Infrared
JCS	Joint Chiefs of Staff
KCAS	Knots Calibrated Air Speed
km	Kilometer
LORAN	Long-Range Navigation
LS	Lima Site
MR	Military Region
NVA	North Vietnamese Army
NVN	North Vietnam; North Vietnamese
OIC	Officer in Charge
PDJ	Plaine des Jarres; Plain of Jars
PL	Pathet Lao

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QRF	Quick Reaction Force
RBS	Radar Bomb Scoring
RLAF	Royal Laotian Air Force
RLG	Royal Laotian Government
RNO	Results Not Observed
RVN	Republic of Vietnam
SAC	Strategic Air Command
SEA	Southeast Asia
SGU	Special Guerrilla Units
SLAR	Side-Looking Airborne Radar
SOW	Special Operations Wing
tac	Tactical
TACAN	Tactical Air Navigation
TACC	Tactical Air Control Center
TAWC	Tactical Air Warfare Center
TIC	Troops in Contact
UHF	Ultra High Frequency
USAF	United States Air Force
VFR	Visual Flight Rules
VHF	Very High Frequency